Remarks

Reconsideration of claims 1-6, as well as newly-presented claims 7- 9, is respectfully requested.

In the Office action dated December 10, 2004 (application Paper No. not shown), the Examiner rejected all pending claims under 35 USC § 103(a). The Examiner's various rejections will be addressed below in the order appearing in the Office action.

35 USC § 103(a) Rejection - Claims 1-3

The Examiner first rejected claims 1-3 under 35 USC 103(a) as being unpatentable over US Patent 6,347,174 (Onishi et al.). The Examine cited Onishi et al. as teaching "an optical fiber .. [with] D/d ratio ranges from 25.5 to 30.5. Onishi et al. use a higher-refractive-index Ge-doped silica core instead of pure silica core. Both materials are well known in the art to be used to manufacture portions of optical fibers ... It would have been obvious to one having ordinary skill in the art at the time the invention was made to use pure silica, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice ... The motivation would be to remove a step of doping the silica and make the manufacturing process cheaper and less time-consuming".

In response, applicant cannot agree with the Examiner's characterization of Onishi et al. as rendering obvious the subject matter of the present invention as defined by rejected claims 1-3. As discussed throughout the cited reference, Onishi et al. is directed to the formation of a "nonlinear fiber", which is known to be a very different type of fiber than the single mode fiber of the present invention. Indeed, it is very important for the purposes of Onishi et al that the core region be Ge-doped (so as to "up dope" the core, and "down dope" the cladding). In this respect, the Examiner is referred to Onishi et al. at column 3, beginning at line 14, where it states:

> Also, in the nonlinear optical fiber according to the present invention, at least the above-mentioned core region is doped with GeO_2 of not less than 15 mol % but not greater than 35 mol % on average, so as to realize a desirable refractive index

> profile. Thus, with respect to signal light in a desirable wavelength band (light in the 1.55-μm band having often been used recently), this nonlinear optical fiber not only generates a nonlinear phenomenon with high efficiency but also is effective in that favorable signal light transmission characteristics can be secured, for example. In other words, this nonlinear optical fiber can yield converted light having a practically sufficient power at a shorter length".

From the above, therefore, it is clear that Onishi et al. requires the use of a Ge-doped core in order to provide the desired nonlinear properties - issues with respect to the amount of time required to form the nonlinear fiber are not considered to be germane. Further, the excessive D/d ratio (upwards of 25) associated with Onishi et al. is also associated with the formation of a nonlinear fiber, and sufficiently removed from the value of "approximately 8.5" associated with amended claim 1.

In contrast, the present invention is specifically related to the formation of a "single mode" pure silica core optical fiber, suitable for long wavelength operation, having a D/d ratio of approximately 8.5 The specification has been amended to further define "approximately 8.5" as primarily in the range of 8 to 10. Values greater than 10 do not further enhance the inventive features of applicant's single mode fiber. In contrast, the fiber of Onishi et al. reference is constrained by both the conventional fiber outer diameter (125 μm) and the desired core diamteter (2a). The "D/d" ratio is merely a mathematical definition of the physical property of the nonlinear Oshini et al. fiber and was not considered by Onishi et al. as an important design parameter. The language of "approximately 8.5" has therefore been inserted in independent claim 1 to further differentiate the teachings of the present invention from the cited Onishi et al. reference.

Applicant asserts that Onishi et al. is limited to disclosing the formation of a "nonlinear fiber"; there is no teaching of forming "single mode" fiber in Onishi et al. The Onishi et al. fiber *requires* the use of a Ge-doped core to provide the desired nonlinear functionality, the fiber of the present invention *requires* the use of a pure silica core. They cannot be interchanged. Lastly, independent claim 1 has been amended to define the D/d ratio as "approximately 8.5" (meaning, values generally in the range of 8-10). Clearly, this amended definition is easily distinguishable from the value associated with the Onishi et al. nonlinear fiber.

Based on all of the above, applicant respectfully requests the Examiner to reconsider the rejection of claim 1, as well as claims 2 and 3 that depend therefrom.

35 USC § 103(a) Rejection - Claim 4

Claim 4 was next rejected by the Examiner under 35 USC 103(a) as being unpatentable over Onishi et al., as applied to claim 1. The Examiner further stated that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to conduct experiments and find the optimal range, since it has been held where the general conditions of a claim are disclosed, discovering the optimum or working ranges involves only routine skill in the art".

While that may be the case, applicant asserts that "routine experimentation" would not have found the range of D/d values associated with the present invention to be utilized in the Onishi et al. *nonlinear* fiber. Indeed, referring to FIG. 5 of Onishi et al, it is clear that the "cladding" layer (defined by its diameter 2b) is maintained at the conventional, nominal value of 125 μm. This is a standard fiber value, and not one associated with a layer-by-layer structure formed as defined by the present invention. Given the restriction of the Onishi et al cladding diameter, applicant asserts that it is not obvious to derive a fiber having the dimensions of the present invention. Moreover, as discussed above, Onishi et al. does not disclose or suggest the use of a pure silica core, or the formation of a single mode fiber.

Based on all of these differences, therefore, applicant asserts that Onishi et al. cannot be found to render obvious the teaching of the present invention as defined by dependent claim 4.

35 USC § 103(a) Rejection - Claims 5 and 6

The Examiner next rejected claims 5 and 6 under 35 USC 103(a) as being unpatentable over Onishi et al. in view of Hecht. The Hecht reference was cited by the Examiner as teaching an "MCVD process where multiple fine layers of difference refractive indices (to distinguish core and cladding) are deposited on the inner wall of a glass tube". The Examiner then concluded that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to use pure silica,

wince it has been held to be within the general skill of a worker in the art to use the MCVD process to manufacture the optical fiber".

In response, applicant asserts that the combination of Onishi et al. with Hecht cannot be found to render obvious the process of claims 5 and 6. The process of the present invention, as described in the specification, deposits a "plurality" of layers to form the desired thickness (D) for the cladding layer. Since this layer is substantially thicker than that associated with conventional single mode fibers, anywhere between 15 to 90 layers are required to be deposited.

In contrast, the "multiple fine layers" of Hecht, as described at page 136 of the reference, are used to form a "graded index" transition region between the core and the cladding (and, in fact, are formed as the outer part of the core). The graded index, as its name suggests, modified the refractive index for each "fine" layer being deposited, so as to gradually change the index of refraction between the core and cladding (as contrasted with a step index fiber). There is no teaching in Hecht of forming "multiple" cladding layers, nor is there any teaching of forming "multiple" layers having the same refractive index. The intent of Hecht is to change the index of each layer as it is deposited.

Additionally, applicant asserts that the combination of Onishi et al. and Hecht does not disclose or suggest any method of forming a "single mode" fiber (since Onishi et al. relates only to nonlinear fibers), nor forming a fiber with a D/d ratio of approximately 8.5, as defined by amended claim 5.

Based on all of the above, therefore, applicant respectfully requests the Examiner to reconsider his rejection and find claim 5 (as well as dependent claim 6) to be in condition for allowance over the combination of Onishi et al. and Hecht.

In summary, applicant has amended portions of the specification and the claims so as to more clearly define the subject matter of the present invention. Additional claims 7-9 are presented for review by the Examiner. Applicant believes that the claims, as amended, are in condition for allowance over the cited Onishi et al. and Hecht references. Applicant thus respectfully requests the Examiner to review the amendments and find the

claims allowable over these references. If for some reason or other the Examiner does not agree that the case is ready to issue and that an interview or telephone conversation would further the prosecution, the Examiner is invited to contact applicant's attorney at the telephone number listed below.

Respectfully submitted,

Daniel Scott Homa

By: Wendy W. Koba

Wendy W. Koba
Reg. No. 30509
Attorney for applicants
610-346-7112

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